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Project file

December 17, 1956

PACKAGING MANUAL
FOR
HOT DIP BARRIER MATERIAL

1210-G-2

Contract No. RD-88
Task Order No. 2

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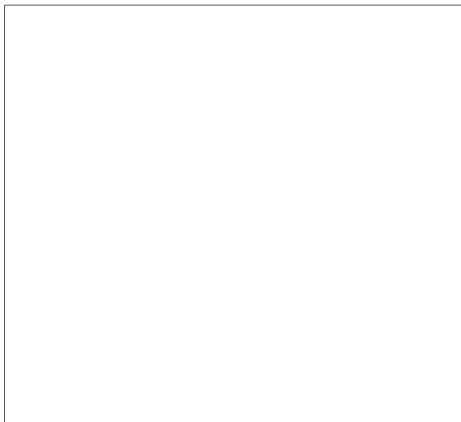
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Introduction

The immersion of hardware, machine parts, etc., in hot plastic to obtain a protective barrier on the item is a common process. This practice has been extended to items of an explosive and heat sensitive nature. Therefore, this manual will treat the requirements necessary to obtain a protective coating for the heat sensitive items listed in Tables I and II. Plastic, such as that defined under JAN-C-149, Type II, will be used to obtain the protective barrier in the manner described in this manual. This material provides a suitable protection against impact under the conditions of normal handling, and against moisture when the items are stored over long periods of time, when used in conjunction with supplementary barriers, e.g., aluminum foil.

The units which can be successfully dipped by this method are divided into two classes, those which are buoyant in the plastic (Table I) and those which are not (Table II).

TABLE I - BUOYANT UNITS

| <u>Item</u> | <u>Type of Package As Received from Stock</u> | <u>*Preliminary Preparation Required</u> |
|---|---|--|
|  | Cardboard Box | Yes |
| | Cardboard Box | Yes |
| | Cardboard Box and Cans | Yes |
| | Tear Strip Can | No |
| | Cardboard Box | Yes |
| | Tear Strip Can | No |

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~~CONFIDENTIAL~~**CONFIDENTIAL****TABLE I - BUOYANT UNITS**

(continued)

| <u>Item</u> | <u>Type of Package As Received from Stock</u> | <u>*Preliminary Preparation Required</u> |
|-------------|---|--|
| | Paper Wrapping | Yes |
| | Unwrapped Spool | Yes |

*See section on Preparation of Packages (Page 8) for details.

TABLE II - NON-BUOYANT UNITS

| <u>Item</u> | <u>Type of Package As Received from Stock</u> | <u>*Preliminary Preparation Required</u> |
|--------------|---|--|
| Thermit Well | Wax Impregnated Boxes | Yes |
| | Cardboard Box | No |
| | Metal Can | No |
| | Metal Can | Yes |
| | Tear Strip Can | No |
| | Cardboard Box | Yes |
| | Cardboard Box | Yes |
| | Cardboard Box | Yes |

*See section on Preparation of Packages for details.

Safety Factors

The units listed in Tables I and II have been subjected to a cook-off period of one hour. None of the units detonated or caught fire in this interval. Therefore, one-half hour is considered a safe time for any of the above items to remain in

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the hot plastic. This period of time is adequate to recover any packages lodged or wedged in the dip tank.

A recovery basket, placed at the bottom of the tank and with handles extending well out of the plastic, is recommended for quick removal of lost items which are not buoyant. A set of heavy duty tongs for recovery of buoyant articles are a necessity.

Most of the items can be used, even if subjected to the hot dip bath for the half-hour period. The items in Table III are the exceptions to the above statement.

TABLE III
LIST OF ITEMS WHICH WERE SEVERELY AFFECTED BY
BEING LEFT IN HOT PLASTIC FOR ONE HOUR.

| <u>Unit</u> | <u>Elapsed Time</u> | <u>Reason</u> |
|---|---------------------|---|
| <div style="border: 1px solid black; width: 275px; height: 125px;"></div> | 15 minutes | Decomposition of cellulose nitrate disc |
| | 3 " | Melting of wax |
| | 5 " | Melting of wax and tars |
| | 10 " | Melting of polyethylene inner packaging |

To overcome the loss of the cans of , it is recommended that a layer of corrugated cardboard be used as a liner. This will act as thermal insulation and preserve the polyethylene.

The rolls of could be reclaimed if wrapped with kimpak or equivalent.

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SECRETMaterials Required

JAN-C-149, Type II

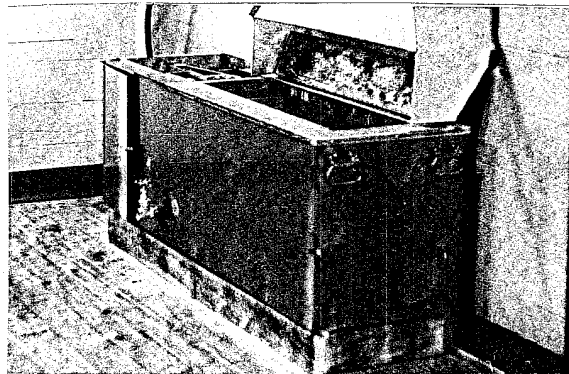
Flexible MIL-B-131, Type B

JAN-P-127, Type I, grade B

JAN-P-115

Preparation of Tank and Plastic

The following instructions for tank and plastic preparations is based on the use of a Fidelity Chemical Products Corporation Model 1236 Dip Tank (Figure 1). However, the procedure can be applied to any commercially available oil jacketed, indirect heating plastic dip tank, since essentially all dip tank designs follow the same principles. Table model tanks usually have no pre-melt area, however, a spatula can be used to remove any air bubbles.



Dip Tank and Dip Area

Figure 1

When the tank is being used for the first time, the pre-melt opening of the tank is filled with as much plastic as possible without forcing an excess of material into the area. A piece of plastic is used to cover the bottom and the sides of the

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dipping area. This is done since the heating coils run up the side of the tank and a thin layer of plastic will be in contact to the heating surface and therefore, melt sooner.

The tank thermost is set at 150 Deg. F. When this temperature is attained, raise the thermostat setting 25 Deg. F approximately every five minutes until a setting of 300 Deg. F is reached. As the plastic melts, more may be added to the dip tank.

The pump heat is brought up to temperature by means of a thermostatic control in the manner described above. When the pump temperature reaches equilibrium at about 300 Deg. F., set both pump and tank temperatures at 325 Deg. F and throw on the motor switch. If the motor labors, throw the motor switch off and try again after waiting 5 minutes.

When the motor is running freely and the plastic is flowing out of the pump opening, allow the pump to continue running. If the dipping area is not filled with plastic to the top of the plate dividing the dipping and pre-melt area, fill it at this time.

Drop the lid over the dipping area and allow the covered tank to run for about 20 minutes. Shut off the pump motor and allow the air bubbles to come to the top of the tank. Start the motor and run until the air bubbles have passed over the dipping area, and into the pre-melt section.

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Repeat this operation until plastic runs smoothly (i.e., until no air bubbles form on the top of the plastic in the dip area). The plastic and the tank are now ready for the dipping operation. These are general instructions and should be supplemented by whatever a particular manufacture recommends.

The original level of the plastic should be maintained at all times. Therefore, a new plastic may be added as need to the pre-melt section at any time. In conjunction with the plastic, caution must be exercised at all times not to raise the temperature of the plastic above 350 Deg. F for periods of two hours or longer since the plastic will be damaged and not yield the protection desired.

After the dipping operation has been completed, drop the temperature of the tank to 225 Deg. F and shut the motor off. This will be practiced when the tank is being shut down overnight. As a result, when operations are started again, the tank thermostat may be set at 325 Deg. F without the preheating period. If the tank is to be shut down for any extended period, both the heater and the motor thermostats will be shut off.

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SECRETPreparation of Packages

As some of the units are not suitable for immersion in the hot plastic as received from stock, they must be treated for the hot dip process. Those units packaged in tear strip cans may be dipped upon being received.

Units which require preparation, noted in Table I and II, generally are packaged in cardboard boxes. The reason for preparing this type package is evident, since a considerable amount of plastic would flow through openings in the package. Another reason, is the formation of air bubbles on the plastic coat, due to the expansion of air within the package.



Figure 3

C-4 before preparation

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A small opening is left in one corner of the bag and the nozzle of a vacuum line is inserted in this hole.

When the scrim material is pulled into contact with the package by the vacuum and with the vacuum line still applied, a hot hand sealer is used to constrict the opening as shown in Figure 4.

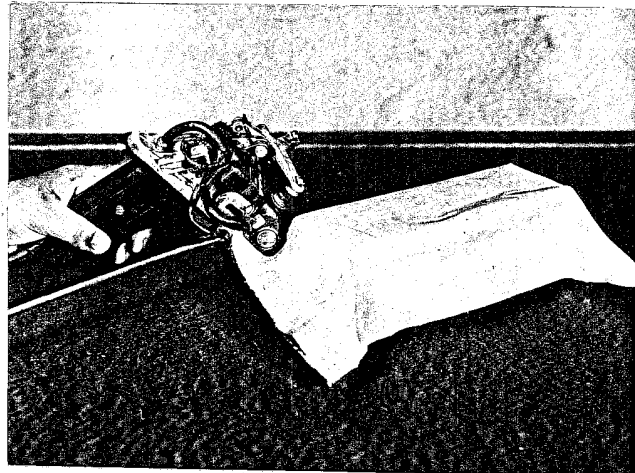


Figure 4

Sealing off package while being pumped down.

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Obtaining the Protective Coat

Factors affecting the thickness of the plastic coat are primarily the dipping temperature and the immersion time. Other factors, of a secondary nature, are the heat capacity and conductivity of the package being dipped which are dependent on the dip temperature and immersion time.

The most suitable temperature for the hot plastic is 320 Deg. F. At this temperature, a coating of approximately 5/32" is obtained. Thinner barriers (1/16") may be obtained by raising the temperature to 350 Deg. F; however, this temperature should be maintained for short intervals since the plastic compound may be damaged and not yield the protection expected. Heavier barriers (1/4") may be obtained at 300 Deg. F.

Two methods of dipping may be used, the single and the double dip. The method will depend upon the size and the shape of the package and the required thickness of the barrier.

Double Dip Method

Double dipping, which is illustrated in Figures 7 and 8, is used primarily on buoyant items or on non-buoyant which may be hard to dip because of their configuration or weight.

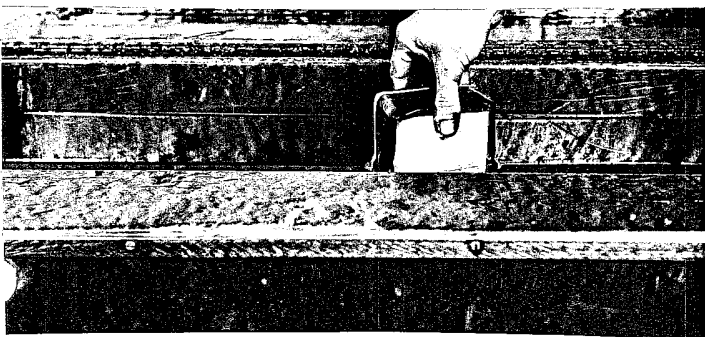


Figure 7

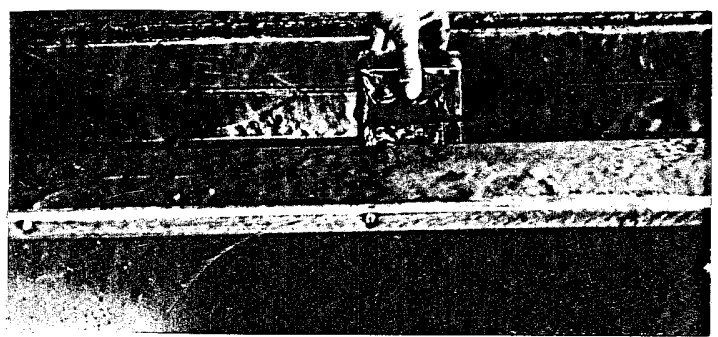


Figure 8

Double Dipping of Package

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To double dip an item one end is dipped first for a period of three seconds. Hold the dipped item at a 45 degree angle over the pre-melt area so that the excess plastic will drain and bring all the drippings to one point. A half turn of the package will wrap the drippings around the end and give protection where it is needed most. Support the item on its undipped end in front of quick drying fan, until the initial coat sets.

The item is then reversed and dipped into the plastic so that an overlap of at least an inch and a half (1-1/2") is obtained. The second dip should be for a period of at least five seconds to insure a good bond at the joint by partially re-melting the first dip layer.

Again follow the procedure used on the initial dip for draining, and setting up of the plastic coat.

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SECRETSingle Dip Method

Although few of the units in Table I are particularly suited for single dipping, this method will be described so that it may be referred to if necessary.

The unit is suspended by a nonhygroscopic cord which meets JAN-P-115 specification and the unit is completely immersed in one dip. Figure 9 demonstrates this method.

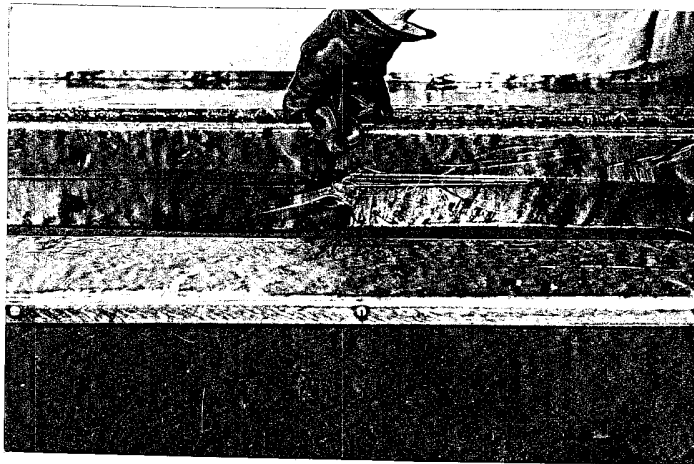


Figure 9

Single Dip of Package

Dipped packages are suspended until the coating has set up and cooled sufficiently, so that handling will not damage the coat. The setting up period may be accelerated by forced air or cold air. Water should not be used to cool the plastic under any circumstances. All packages should be suspended in such a manner that the excess plastic tends to drain from the package from a single point. When the plastic has set up, clip off the suspending cord and seal off the end with a soldering iron, taking care to insure that the cord end is covered by a layer of plastic. Surplus plastic can be trimmed from the run-off to make a neater package.

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Inspection, Packaging and Cautions

The packaged units should be allowed thirty (30) minutes to set up to insure proper setting of the plastic before shelf stocking. At this time, they should be visually inspected for any areas of incomplete coverage or faults in the barrier. If any poor areas are noted, they should be touched up by using a soldering iron. Then more plastic should be fed into the area touched up. This process is quite similar to the common soldering technique and is demonstrated in Figure 10.

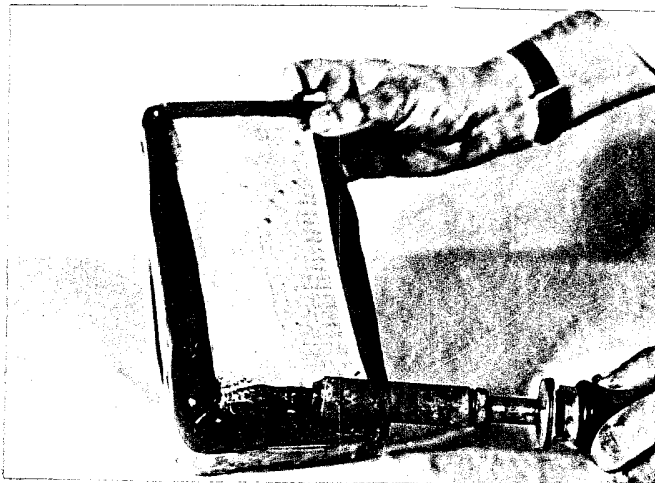


Figure 10

Touching Up

In dipping cylindrical cans, it is very important to allow the plastic to drain off at a 45 degree angle so that bubbles will not be trapped on the bottom of the can.

The plastic may be used a number of times provided it is not contaminated with dirt or grease. Plastic of any other formula should not be combined with the initial material. It is most prudent to use plastic supplied by the same manufacturer.

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The combination of unlike compounds may cause phase separation and not yield expected protection. Any units in which a large number of bubbles appear in the plastic should be stripped and the plastic should be treated in accordance with detailed instructions in the section, "Preparation of Tank and Plastic".

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